

ABSTRACT

The present invention relates to the use colloidal particles to realize photonic and microfluidic devices. In particular embodiments, colloidal particles are used to realize microfluidic a two-way valve, three-way valve, check valve, three-dimensional valve, peristalsis pump, rotary pump, vane pump, and two-lobe gear pump. In certain embodiments, actuation of an active element in the microfluidic structure is accomplished by electrophoresis, the use of an optical trap or "tweezer", or the application of an electric field or magnetic field. In other embodiments, the application of an electrical field to colloidal particles that are substantially constrained to two dimensional movement is used to realize wave guides, filters and switches for optical signals.